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EUROPEAN PATENT APPLICATION

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54 Method for preparing 6-chloro-N-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine.

57 A novel process for preparing 6-chloro-N-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine comprising cyclizing N-methyl-N-[2-(2'-chlorophenyl) ethyl]-2-chloroethylamine hydrochloride in a solution of trichlorobenzene and aluminum chloride.

1 METHOD FOR PREPARING 6-CHLORO-N-METHYL-
 2,3,4,5-TETRAHYDRO-1H-3-BENZAZEPINE

5 This invention relates to a novel process for pre-
paring 6-chloro-N-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine.
This compound has been disclosed as having utility as an
alpha₂ antagonist, a pharmacological action which is
associated with a broad spectrum of beneficial cardiovascular
activity. The compound is particularly useful as an anti-
10 hypertensive agent. (United States Patent No. 4,465,677)

BACKGROUND OF THE INVENTION

15 In the above noted patent the title compound is
prepared by cyclizing N-methyl-N-[2-(2'-chlorophenyl)-
ethyl]-2-chloroethylamine hydrochloride under Friedel-Crafts
conditions. The cyclization step is carried out using Lewis
acids such as aluminum chloride in a melt of ammonium chloride.

 United States Patents 4,251,660 and 4,200,754
20 disclose a method of preparing tetrahydroisoquinolines. Both
of these patents employ aluminum chloride as the cyclization
agent. The '660 patent teaches that the reaction is done in
the absence of an organic solvent. The '754 patent discloses
that the reaction is done with conventional Friedel Crafts
25 solvents, i.e., methylene chloride, tetrachloroethylene or
dichloroethane. Other well known solvents employed during the
Friedel Crafts reaction are nitrobenzene or decalin.

 The above methods which employ either the con-
ventional solvents or a melt in the process all proved
30 commercially unsatisfactory when used in an attempt to prepare
6-chloro-N-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine. These
prior art methods resulted in very poor yields, from
relatively no yield to about 25%, with the production of
undesired isomers and other impurities.

35 In addition to the above conventional Friedel-Crafts
solvents, chlorinated organic solvents such as monochloro and

1 dichlorobenzene have been attempted with resultant low yields.

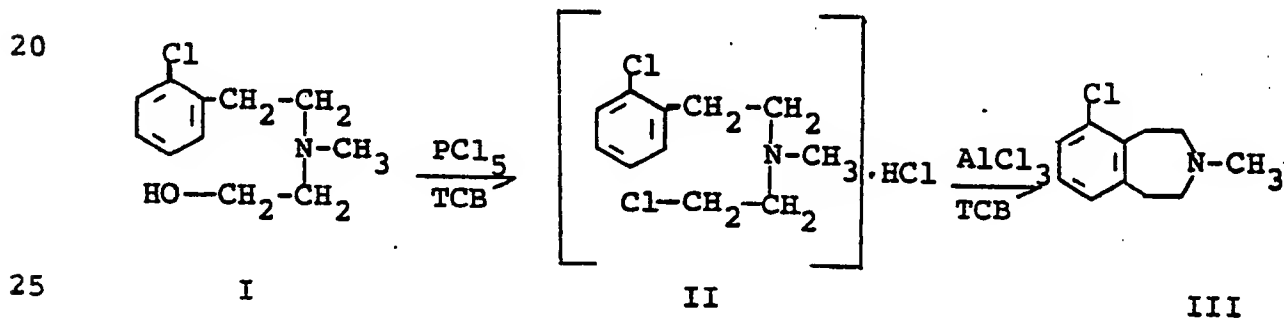
DESCRIPTION OF THE INVENTION

5 The novel process of this invention, which uses trichlorobenzene as the solvent, is unexpected in view of the prior art. The process selectively produces the desired 6-chloro isomer in greater than 90% yields. There is little isomerization, such as formation of the 7-chloro isomer.

10 Unlike the conventional Friedel-Crafts solvents which result in decomposition to liquid and solid black masses, there is no decomposition and near quantitative yields when trichlorobenzene is employed. The process is clean and is readily adaptable to commercial scale. Further, the process is cost

15 effective and the yield is up dramatically as compared to prior art methods.

The chemical method of this invention is represented by the following reaction.



According to the above method, N-methyl-N-[2-(2'-chlorophenyl)ethyl]-2-hydroxyethyl-amine (Formula I) is chlorinated with a chlorinating agent, such as, phosphorous pentachloride in trichlorobenzene and converted to N-methyl-N-[2-(2'-chlorophenyl)ethyl]-2-chloroethylamine hydrochloride (Formula II) in situ. This is not isolated but converted directly to the N-methyl-6-chlorobenzazepine hydrochloride (Formula III) by the addition of aluminum chloride to the

30 reaction mix. The reaction is carried out at a temperature of from about 180° C. to about 215° C. (refluxing temperature) for a period of from about 3 to 8 hours, depending on

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1 conditions such as temperature, pressure, and concentration of
aluminum chloride. The application of pressure permits a
higher concentration of aluminum chloride thereby decreasing
reaction time considerably, more than four fold.

5 Advantageously, the pressure is greater than two atmospheres.
The free base obtained from the hydrochloride salt after
treatment with aqueous alkali is purified by distillation
followed by conversion to the hydrochloride and recrystal-
lization from methanol-ethyl acetate.

10 The reaction mixture is conveniently and optionally
worked up by methods known to the art. Most commonly this
involves quenching the reaction mixture, removal of the
aluminum salts followed by extraction and purification of the
final product.

15 The method of this invention is successfully carried
out employing the isomers of trichlorobenzene, for example, the
reaction progresses as expected if the 1,2,4; 1,2,3; or 1,3,5
isomer of trichlorobenzene or mixtures of them is used as the
solvent. Advantageously, technical grade 1,2,4 isomer is
20 employed because it has the lowest melting point (17° C.) and
thus the greatest liquid working range.

The cyclization agent is aluminum chloride which forms
a Friedel-Crafts complex which in turn cyclizes to form the
desired product. Stoichiometric quantities of aluminum
25 chloride may be used. In practice from about 2.4 to 3 mole
equivalents of aluminum chloride compared to the starting
material (Formula I) are employed. Excess amounts of aluminum
chloride are not detrimental to the reaction.

The following example illustrates the process of this
30 invention but is not to be construed as a limitation thereof.

EXAMPLE

A mixture of 121 l of 1,2,4-trichlorobenzene and 19.5
Kg. (75.0 m) of N-methyl-N-[2-(2'-chlorophenyl)ethyl]-2-hydroxy-
35 ethylamine was agitated at a temperature of 20-30° C. and a
homogenous solution was obtained. Phosphorous pentachloride,
7.2 Kg. (34.6 m) was added and the temperature was brought to

1 110° C.

To the above solution, containing N-methyl-N-[2-(2'-chlorophenyl)ethyl]-2-chloroethylamine hydrochloride, was slowly added 24.4 Kg. (18.3 m) of aluminum chloride while the temperature was maintained between 95° and 110° C. The reaction was then brought to a reflux temperature of 205° C. for six hours.

The reaction was quenched over a 2 hour period by cooling to 80° C. with an acidic aqueous mixture (450 l of H₂O, 18 l of HCl) with agitation. The quench was allowed to settle and the trichlorobenzene layer was separated.

The aqueous quench was layered with toluene (120 l) and the two phase mixture was brought to a pH of at least 11 with 50% aqueous sodium hydroxide.

The aqueous phase was extracted with toluene (120 ml) and the phases separated. The aqueous wash was discarded and the toluene phase was fractionally distilled. After removal of the toluene, the distillate at 134° to 143° C. pot temperature and 126° to 140° C. vapor temperature at 15 to 20 torr was collected and resulted in a 91% yield of 6-chloro-3-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine as the free base.

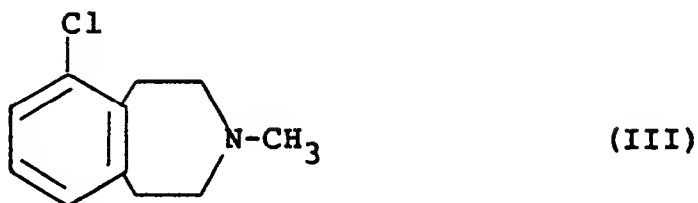
The above oily base in toluene was treated with anhydrous hydrogen chloride, then recrystallized from methanol/ethyl acetate yielded 6-chloro-3-methyl-2,3,4,5-tetrahydro-1H-3-benzazepine hydrochloride, m.p. 268-270° C (d).

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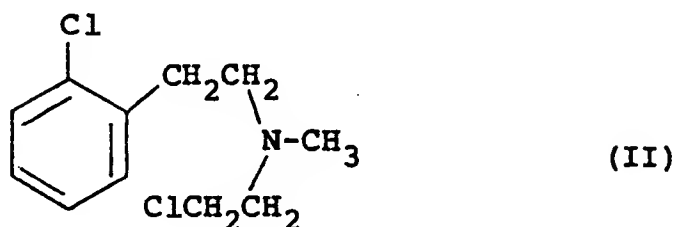
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Claims.

1. A process for the preparation of a compound of the formula (III)



which comprises cyclisation of a compound of formula (II)

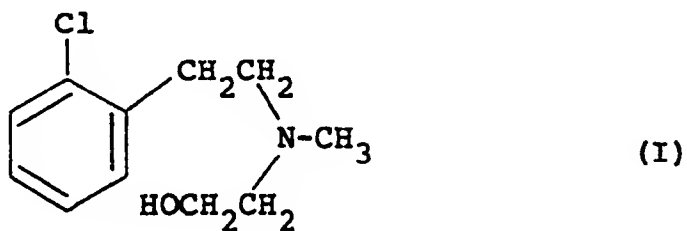


in the presence of aluminium trichloride, characterised in that the solvent comprises trichlorobenzene.

2. A process as claimed in claim 1 in which the solvent is 1,2,4-trichlorobenzene.

3. A process as claimed in claim 1 or claim 2 in which the reaction is carried out at a temperature of from about 180°C to about 215°C for a period of from about 3 to 8 hours.

4. A process as claimed in any one of claims 1 to 3 in which the compound of formula (II) is prepared by reaction of a compound of formula (I)



with phosphorous pentachloride in trichlorobenzene.

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N-methyl-N-[2-(2'-chlorophenyl)ethyl]-2-chloro-
ethylamine hydrochloride
in a solution of trichlorobenzene and aluminum chloride.

EP 0 174 118 A3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 080 779 (SMITHKLINE) * Page 17, line 16 - page 18, line 2; page 16, line 35 - page 17, line 14 *	1,4	C 07 D 223/16 // C 07 C 87/28
A	--- GB-A-1 221 324 (GEIGY) * Page 2, lines 38-42; page 3, lines 91-108; page 4, lines 10-24, 39-56 *	1-3	
A	--- JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, vol. 78, 20th May 1956, pages 2185-2190; H. JUNGK et al.: "Kinetics of methylation and ethylation of benzene and toluene in 1,2,4-trichlorobenzene under the influence of aluminum bromide; mechanism of the alkylation reaction" * Page 2185, column 2, lines 14-18 *	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			C 07 D 223/00 C 07 D 203/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23-09-1986	Examiner BRENNAN J.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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